

# PCT

## INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference <b>MBZ-0345</b>	<b>FOR FURTHER ACTION</b> see Notification of Transmittal of International Search Report (Form PCT/ISA/220) as well as, where applicable, item 5 below.	
International application No. <b>PCT/EP 99/ 04407</b>	International filing date (day/month/year) <b>24/06/1999</b>	(Earliest) Priority Date (day/month/year) <b>20/07/1998</b>
Applicant <b>MBT HOLDING AG et al.</b>		

This International Search Report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This International Search Report consists of a total of 3 sheets.

☒ It is also accompanied by a copy of each prior art document cited in this report.

### 1. Basis of the report

- a. With regard to the **language**, the international search was carried out on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.

☐ the international search was carried out on the basis of a translation of the international application furnished to this Authority (Rule 23.1(b)).

- b. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international search was carried out on the basis of the sequence listing :

☐ contained in the international application in written form.

☐ filed together with the international application in computer readable form.

☐ furnished subsequently to this Authority in written form.

☐ furnished subsequently to this Authority in computer readable form.

☐ the statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.

☐ the statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished

2. ☐ **Certain claims were found unsearchable** (See Box I).

3. ☐ **Unity of invention is lacking** (see Box II).

4. With regard to the **title**,

☒ the text is approved as submitted by the applicant.

☐ the text has been established by this Authority to read as follows:

5. With regard to the **abstract**,

☒ the text is approved as submitted by the applicant.

☐ the text has been established, according to Rule 38.2(b), by this Authority as it appears in Box III. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority.

6. The figure of the **drawings** to be published with the abstract is Figure No.

☒ as suggested by the applicant.

☐ because the applicant failed to suggest a figure.

☐ because this figure better characterizes the invention.

1

☐

None of the figures.

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# INTERNATIONAL SEARCH REPORT

International Application No

PCT/EP 99/04407

**A. CLASSIFICATION OF SUBJECT MATTER**  
IPC 7 E21F16/02 E21D11/38

According to International Patent Classification (IPC) or to both national classification and IPC

**B. FIELDS SEARCHED**

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 E21F E21D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	WO 98 24738 A (DISCHOE KAROLY ;MBT HOLDING AG (CH); OPPLIGER MAX (CH)) 11 June 1998 (1998-06-11) cited in the application abstract ---	1-9
Y	FR 2 607 534 A (GARDIOL ENTREPRISE) 3 June 1988 (1988-06-03) the whole document ---	1-9
P, X	EP 0 898 052 A (KOESTER BAUCHEMIE GMBH) 24 February 1999 (1999-02-24) the whole document ---	1, 8, 9
A	WO 87 04756 A (BERGAB BERGGEOLOG UNDERSOEK) 13 August 1987 (1987-08-13) the whole document ---	1-9
	-/--	

☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

\* Special categories of cited documents :

- "A" document defining the general state of the art which is not considered to be of particular relevance
- "E" earlier document but published on or after the international filing date
- "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- "O" document referring to an oral disclosure, use, exhibition or other means
- "P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

- "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search

30 September 1999

Date of mailing of the international search report

07/10/1999

Name and mailing address of the ISA

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## INTERNATIONAL SEARCH REPORT

International Application No

PCT/EP 99/04407

## C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 5 716 711 A (MAINE FRANK ET AL) 10 February 1998 (1998-02-10) abstract ---	1,4,5,8, 9
A	DE 37 41 699 A (NIEDERBERG CHEMIE) 22 June 1989 (1989-06-22) the whole document ---	1
A	PATENT ABSTRACTS OF JAPAN vol. 1995, no. 11, 31 August 1995 (1995-08-31) & JP 07 097900 A (TAKESHI MITANI; OTHERS: 01), 11 April 1995 (1995-04-11) abstract ---	1
A	US 4 695 188 A (PULKKINEN JORMA) 22 September 1987 (1987-09-22) ---	
A	DE 31 27 453 A (HEITKAMP GMBH BAU) 3 February 1983 (1983-02-03) ---	
A	CH 681 475 A (PETER ELLENBERGER) 31 March 1993 (1993-03-31) ---	
A	DE 32 44 000 A (NIEDERBERG CHEMIE) 30 May 1984 (1984-05-30) ---	
A	WO 97 25484 A (WOLFSEHER ROLAND F) 17 July 1997 (1997-07-17) cited in the application ---	
A	EP 0 007 413 A (DYNAMIT NOBEL AG) 6 February 1980 (1980-02-06) -----	

# INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No.

PCT/EP 99/04407

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
WO 9824738	A	11-06-1998	AU 5559798 A CA 2243644 A CN 1210507 A EP 0877720 A	29-06-1998 11-06-1998 10-03-1999 18-11-1998
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WO 9725484	A	17-07-1997	EP 0725185 A AU 1028797 A CN 1214095 A EP 0873451 A NO 983119 A	07-08-1996 01-08-1997 14-04-1999 28-10-1998 03-09-1998
EP 0007413	A	06-02-1980	DE 2833148 A AT 1959 T	07-02-1980 15-12-1982

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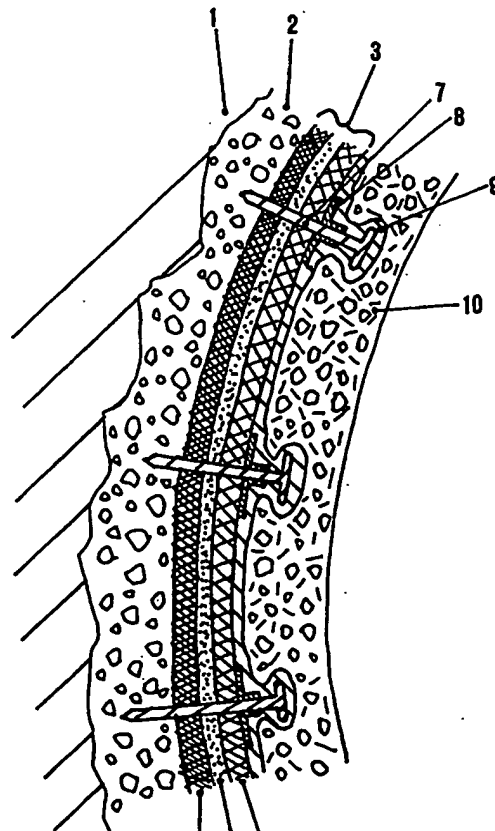
INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification <sup>7</sup> : E21F 16/02, E21D 11/38	A1	(11) International Publication Number: WO 00/05487 (43) International Publication Date: 3 February 2000 (03.02.00)
(21) International Application Number: PCT/EP99/04407 (22) International Filing Date: 24 June 1999 (24.06.99) (30) Priority Data: 9815685.4 20 July 1998 (20.07.98) GB (71) Applicant (for all designated States except US): MBT HOLDING AG [CH/CH]; Vulkanstrasse 110, CH-8048 Zürich (CH). (72) Inventors; and (75) Inventors/Applicants (for US only): BRANDENBERGER, Rolf [CH/CH]; Kirchweg 59, CH-8102 Oberengstringen (CH). GARSHOL, Knut, Finn [NO/NO]; Bregneveien 29, N-1825 Tomter (NO). MELBYE, Tom, Arild [NO/CH]; Oberhausensteig 16, CH-8907 Wettswil (CH). SCHUBERT, Peter, Alexander [AT/AT]; Berg 36, A-5102 Anthering (AT). (74) Agent: McSTEa, John, Anthony; Patents and Trade Marks, MBT (Schweiz) AG, Vulkanstrasse 110, CH-8048 Zürich (CH).		(81) Designated States: AU, JP, NO, SG, US, European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE).  Published With international search report.

(54) Title: WATERPROOF CLADDING

(57) Abstract

A cladding for a partially-overhanging substrate, such as a tunnel wall which comprises, in sequence from the tunnel wall, a drainage means, a sprayed polymeric membrane and a final layer of concrete. The cladding gives an effective cladding in conditions where the tunnel walls suffer from running water at the time of cladding, is easier to apply and requires less material.



Sub  
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- By "partially-overhanging substrates" is meant simply a substrate part of which overhangs. One example is a tunnel bored in rock, which has an overhanging roof and non-overhanging walls, but the substrate can equally well be a construction, for example, an arch of concrete, brick, stone or other material.
- The exposed rock surfaces of tunnels often require cladding, this cladding generally being concrete, which may [be sprayed] (so-called "shotcrete"), [cast in formwork] or [placed in prefabricated sections] which are then grouted. One of the problems frequently encountered is water coming through and running down the substrate during the construction. The standard way of dealing with this problem is the application to the substrate of a drainage means. This is simply something which provides on the substrate a plurality of drainage channels, so that the water is directed away from the substrate to provided drainage outlets. The sequence therefore is usually as follows; apply a drainage means, followed by a waterproof membrane, followed by a final layer of concrete.
- The drainage means known to the art can take various physical forms. One popular type comprises an open mesh made of plastics material, this being generally supplemented by an at least partially waterproof covering sheet to help direct the water to the provided drainage outlets and prevent it, in the case of high water flow, from running straight through. Another common type is a sheet of plastics material (typically of PVC or PE) which provides drainage channels. In one such material, the sheet comprises grooves through which water can run. In another variant, there is formed on the sheet a series of depressions which appear as protrusions on the other side of the sheet. These protrusions hold the sheet off the substrate and allow water drainage. Such drainage means are fixed to the substrate by any convenient means (adhesive, nails, rock anchors).
- To this drainage means is usually attached a waterproof membrane. This is generally a series of overlapping sheets of thermoplastic material which is applied to the drainage

means and secured in place by melting the sheet around bolts previously applied through the drainage means into the rock for this purpose, the sheets then being joined by welding to form a single waterproof sheet. A final layer of concrete is applied to them by any of the methods hereinabove described.

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In practice, this method suffers from a variety of drawbacks. It is difficult to weld the thermoplastic sheets together with complete success, so that there can be imperfect joints where water can come through. Moreover, such sheets may be damaged in handling and application and consequently suffer from leaks. In any case, the work of applying such sheets is time-consuming and difficult in a tunnel, as is the work of erecting the drainage means itself. In all cases, where other fixtures such as railway catenary supports are required, either these have to be driven through the drainage means into the rock (thereby providing a potential point of water entry), or the final concrete layer must itself be strong enough to support them, which usually means using a thickness of concrete not otherwise required.

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It has now been found that such water problems can be substantially or even completely overcome by a particular structure. This invention therefore provides a cladding on a partially-overhanging substrate which comprises, in sequence starting from the substrate;

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- (i) a drainage means;
- (iii) a waterproofing membrane *does this matter* <sup>→</sup> which has been applied thereto by spraying; and
- (iv) a layer of concrete.

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The invention further provides a method of providing a waterproof cladding on a partially-overhanging substrate, comprising the application to the substrate of the following elements in sequence;

30

- (i) a drainage means;
- (iii) a waterproofing membrane, applied by spraying; and
- (iv) a layer of concrete.



In a preferred embodiment of the invention, the substrate is given an initial layer of concrete. This is especially important when the substrate is rough, for example, as a result of blasting, and it preferably applied by means of spraying. Although it can also be done by casting or placing of prefabricated sections, shotcreting has the advantage that it conforms more exactly to the wall while providing a desirable smoother surface for the fixing of drainage means. This makes the final cladding essentially a single unit with the wall, enhancing its strength and making possible a cladding with substantially less material than formerly used.

*this all happens  
because shotcrete before  
drainage*

*drainage known*

The drainage means may be selected from any of the means of this type known to the art. A typical example is a plastics mesh to which is applied (to that side remote from the substrate) an at least partially waterproof layer. A particularly good variety of this type is a mesh to which is fixed a thin plastics impermeable sheet, on the other side of which sheet is a fibrous layer which assists in the bonding of the waterproofing membrane hereinunder described. However, there are many other types possible, and any of the art-recognised types are acceptable.

A preferred drainage means consists of two layers of "geotextile", fibrous materials of the type hereinabove described, between which is a waterproof film. Preferably the geotextile against the rock is hydrophobic and that further removed from the rock is hydrophilic. The hydrophobic layer helps repel water and the hydrophilic layer allows a water-based sprayable membrane to penetrate well and bond thoroughly as further described hereinunder, thus helping create a composite structure. This means is supplied as a single material, a so-called "drainage fleece". Any kind of sprayable membrane is useful in the working of this invention.

One particularly useful type of sprayable membrane is the membrane described in International Application WO 97/25484 the contents of which are incorporated herein by reference. In this case, it is a plastics material applied by spraying (a thermosetting polyurethane is described), the surface of this layer being configured in order to provide anchoring means for subsequently applied layers. This is done typically by mechanically

deforming the surface before it hardens fully, or by embedding therein solid material such as stone chips.

Another particularly useful type of sprayable membrane is described in International Application WO 98/24738, the contents of which are incorporated herein by reference. In this case, the membrane is formed from a layer of coalesced particles of thermoplastic polymer laid down from an aqueous dispersion. Polyurethanes, polyesters and vinyls may be used, but the preferred materials are addition polymers of ethylenically-unsaturated monomers, more preferably, those having a glass transition temperature (T<sub>g</sub>) of below 15°C, even more preferably below -15°C.

The weight solids contents of the aqueous dispersions from which the membranes are formed typically lie within the range of 30-60%. Specific examples of suitable materials include polyurethanes, styrene-butadiene copolymers, ABS (acrylonitrile-butadiene-styrene) polymers, acrylonitrile-butadiene copolymers, styrene-acrylic copolymers, polysulphide dispersions, polyurethane-acrylic dispersions, polyisoprene and PVC latexes and copolymers of vinyl chloride and/or vinyl acetate with acrylic monomers such as (meth)acrylic acid and esters thereof. Materials such as bitumen emulsions may be used in conjunction with these materials, but as such materials do not coalesce, they should not comprise more than 50% by weight solids of the binder. This list is not exhaustive, and the skilled person equipped within the concept of this invention will readily be able to identify other suitable materials. Many such materials are available commercially and examples of suitable commercial materials include those sold by BASF AG under the mark "Acronal" and those sold by Synthomer under the trade mark "Synthomer".

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In addition to the aqueous dispersion, the composition may include other ingredients. One especially useful ingredient is filler. This not only "extends" the composition, but also roughens the surface, thus providing a "key" for a subsequently applied cementitious composition. Its presence is preferred. Typical examples of suitable fillers include quartz sand and quartz flour of average diameters in the range of from 0.04-1.5 mm, as well as dolomite, talc, mica, barytes, iron oxide, titanium dioxide, rubber and plastics granules,

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known  
sprayable member.

lightweight aggregates and glassy furnace residues such as "holospheres". Fibres of steel, glass or polymeric material can also be used, preferred examples of polymeric fibre being those of thermoplastic material, especially polyethylene and polyacrylonitrile, preferably with lengths of from 0.2-12 mm and surface area of from 6-8 m<sup>2</sup>/g.

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Sprayable membranes confer good waterproofness, but cannot be used on a substrate on which there is running water. The combination of drainage means and waterproofing membranes overcomes this difficulty and gives an especially versatile and high-performing system. This is largely because the two components, drainage means and sprayable  
10 membrane, become in effect a single composite entity. The invention therefore also provides a composite waterproofing system for application to surfaces, consisting of a drainage means as hereinabove defined and a sprayed waterproof membrane. In addition, fixtures can be added before the membrane spraying and the subsequent membrane spraying will ensure that the penetration of the fixture through the drainage means remains  
15 watertight. This means that a subsequent layer of concrete need not be load-bearing and therefore can be much thinner than would otherwise be the case.

To the surface of the membrane is applied a layer of concrete. This can be done by any convenient means, but ideally by spraying. Spraying brings many advantages. For  
20 example, the layer conforms with the membrane and forms with it, the drainage means, the substrate and, if applied, any initial concrete layer a single composite entity, thus enhancing the benefits of the composite waterproofing system hereinabove described. This is very strong and reduces substantially the quantities of concrete needed. For example, using prior art-recognised methods, a final concrete layer would need to be typically 25  
25 cm. thick. When this invention is used, a layer may be as low as 5 cm. thick, representing a significant saving in time, money and material. In addition, application methods such as casting require not only complex formwork, but also reinforcing grids. The sprayed concrete does not need this, it being possible, if desired, to provide fibre reinforcement in the concrete mix itself by the inclusion of fibres.

A further important characteristic is that the continuous bond between the sprayed membrane and the final shotcrete layer prevents what often happens on sheet-based systems, namely the movement of water along the membrane-shotcrete interface from the point of actual leakage and its eventual appearance tens of metres from that point. In the system of the present invention, any leakage will take place at the point of leakage itself, and can be easily repaired. *Will not travel along the seam.*

The invention is useful primarily in tunnelling, but it may also be used in free-standing completely artificial structures which comprise partial overhangs of the type hereinabove described, for example, arches of concrete, brick, stone or other such material. In comparison with the art-recognised methods, it is simpler to use, it provides better results and it requires less material and time.

The invention will now be described with reference to the accompanying drawing which depicts a schematic cross-sectional view of a preferred embodiment. In this drawing, the dimensions of some elements have been exaggerated to make clear the nature of the construction.

In the drawing, the invention has been applied to a rock wall 1 of a bored tunnel. To this rock wall is applied an initial layer of shotcrete 2. To this is then applied a drainage fleece, generally designated as 3. This drainage means consists of three elements, a fibrous, hydrophobic sheet 4, a waterproof film 5 and a fibrous hydrophilic sheet 6, the three being combined in a single sheet and secured to the shotcrete layer 2 by means of nails 7 whose heads protrude slightly from the drainage means. The nails additionally comprise fleece retaining means 8, preferably of plastics material, which comprise shanks which are a tight fit on the nails 7 and comparatively large roundels which press the fleece against shotcrete layer 2. The fibrous sheet 6 and the nail heads help a subsequent sprayed membrane 9 to bond more securely to the drainage means.

To the drainage means is applied by spraying a waterproofing membrane 9, the composition of which is

	polymer dispersion <sup>1</sup>	30 parts by weight
	barytes	27 " " "
	calcium carbonate	42.5 " " "
5	titanium dioxide	0.5 " " "

1. styrene-acrylic ester copolymer emulsion 50% solids by weight ("Acronal") (trade mark) S361 (ex BASF))

This corresponds to Example 1 of WO 98/24738.

10 Finally, a layer of reinforcing fibre-containing shotcrete 10 is applied.

The shotcrete formulation useful in this application may be any such formulation useful in such an application. In addition, the skilled person will readily appreciate that there are possible many variations in both materials and methods which fall within the scope of the invention. For example, should enhanced load-bearing strength be needed, the nails 7, depicted in the drawing as being covered by the sprayed membrane 9, may protrude through it and into the shotcrete layer 10. The nail heads provide a "key" which supplements the excellent bonding of the shotcrete to the membrane.

20 In another embodiment, the hydrophobic fibrous sheet may be replaced by a plastics grid which has the form of two parallel sets of elongate intersecting elements, one set resting on the surface of shotcrete layer 2 and spacing the other set from it, thus defining a plurality of drainage channels. The waterproof plastics sheet 5 is advantageously of the same plastics material.

Don't get this exact.

# PCT

## REQUEST

The undersigned requests that the present international application be processed according to the Patent Cooperation Treaty.

For receiving Office use only

International Application No.

International Filing Date

Name of receiving Office and "PCT International Application"

Applicant's or agent's file reference  
(if desired) (12 characters maximum)

MBZ-0345

Box No. I TITLE OF INVENTION  
WATERPROOF CLADDING

Box No. II APPLICANT

Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)

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This person is applicant for the purposes of:

☐ all designated States

☒ all designated States except the United States of America

☐ the United States of America only

☐ the States indicated in the Supplemental Box

Box No. III FURTHER APPLICANT(S) AND/OR (FURTHER) INVENTOR(S)

Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)

BRANDENBERGER Rolf  
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Switzerland

This person is:

☐ applicant only

☒ applicant and inventor

☐ inventor only (If this check-box is marked, do not fill in below.)

State (that is, country) of nationality:

CH

State (that is, country) of residence:

CH

This person is applicant for the purposes of:

☐ all designated States

☐ all designated States except the United States of America

☒ the United States of America only

☐ the States indicated in the Supplemental Box

☒ Further applicants and/or (further) inventors are indicated on a continuation sheet.

Box No. IV AGENT OR COMMON REPRESENTATIVE; OR ADDRESS FOR CORRESPONDENCE

The person identified below is hereby/has been appointed to act on behalf of the applicant(s) before the competent International Authorities as:

☒ agent

☐ common representative

Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country.)

McSTEa John Anthony  
Patents and Trade Marks  
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Teleprinter No.

☐ Address for correspondence: Mark this check-box where no agent or common representative is/has been appointed and the space above is used instead to indicate a special address to which correspondence should be sent.

## Continuation of Box No. III FURTHER APPLICANT(S) AND/OR (FURTHER) INVENTOR(S)

*If none of the following sub-boxes is used, this sheet should not be included in the request*

Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)

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Norway

This person is:

- ☐ applicant only  
☒ applicant and inventor  
☐ inventor only (If this check-box is marked, do not fill in below.)

State (that is, country) of nationality:  
NO

State (that is, country) of residence:  
NO

This person is applicant for the purposes of:

- ☐ all designated States ☐ all designated States except the United States of America ☒ the United States of America only ☐ the States indicated in the Supplemental Box

Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)

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This person is:

- ☐ applicant only  
☒ applicant and inventor  
☐ inventor only (If this check-box is marked, do not fill in below.)

State (that is, country) of nationality:  
NO

State (that is, country) of residence:  
CH

This person is applicant for the purposes of:

- ☐ all designated States ☐ all designated States except the United States of America ☒ the United States of America only ☐ the States indicated in the Supplemental Box

Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)

SCHUBERT Peter Alexander  
Berg 36  
A-5102 Anthering  
Austria

This person is:

- ☐ applicant only  
☒ applicant and inventor  
☐ inventor only (If this check-box is marked, do not fill in below.)

State (that is, country) of nationality:  
AT

State (that is, country) of residence:  
AT

This person is applicant for the purposes of:

- ☐ all designated States ☐ all designated States except the United States of America ☒ the United States of America only ☐ the States indicated in the Supplemental Box

Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)

This person is:

- ☐ applicant only  
☐ applicant and inventor  
☐ inventor only (If this check-box is marked, do not fill in below.)

State (that is, country) of nationality:

State (that is, country) of residence:

This person is applicant for the purposes of:

- ☐ all designated States ☐ all designated States except the United States of America ☐ the United States of America only ☐ the States indicated in the Supplemental Box

☐ Further applicants and/or (further) inventors are indicated on another continuation sheet.

## Box No.V DESIGNATION OF STATES

The following designations are hereby made under Rule 4.9(a) (mark the applicable check-boxes; at least one must be marked):

## Regional Patent

- ☐ AP ARIPO Patent: GH Ghana, GM Gambia, KE Kenya, LS Lesotho, MW Malawi, SD Sudan, SZ Swaziland, UG Uganda, ZW Zimbabwe, and any other State which is a Contracting State of the Harare Protocol and of the PCT
- ☐ EA Eurasian Patent: AM Armenia, AZ Azerbaijan, BY Belarus, KG Kyrgyzstan, KZ Kazakhstan, MD Republic of Moldova, RU Russian Federation, TJ Tajikistan, TM Turkmenistan, and any other State which is a Contracting State of the Eurasian Patent Convention and of the PCT
- ☒ EP European Patent: AT Austria, BE Belgium, CH and LI Switzerland and Liechtenstein, CY Cyprus, DE Germany, DK Denmark, ES Spain, FI Finland, FR France, GB United Kingdom, GR Greece, IE Ireland, IT Italy, LU Luxembourg, MC Monaco, NL Netherlands, PT Portugal, SE Sweden, and any other State which is a Contracting State of the European Patent Convention and of the PCT
- ☐ OA OAPI Patent: BF Burkina Faso, BJ Benin, CF Central African Republic, CG Congo, CI Côte d'Ivoire, CM Cameroon, GA Gabon, GN Guinea, GW Guinea-Bissau, ML Mali, MR Mauritania, NE Niger, SN Senegal, TD Chad, TG Togo, and any other State which is a member State of OAPI and a Contracting State of the PCT (if other kind of protection or treatment desired, specify on dotted line) .....




National Patent (if other kind of protection or treatment desired, specify on dotted line):


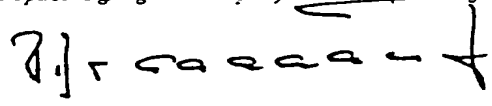
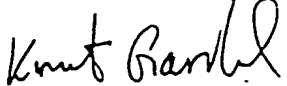
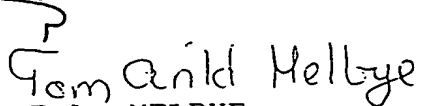
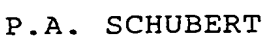
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| <input type="checkbox"/> KR Republic of Korea .....                     |   |
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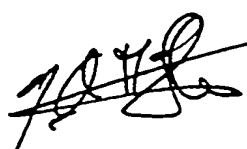
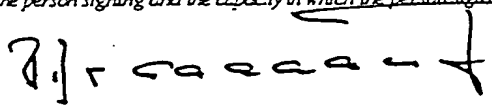
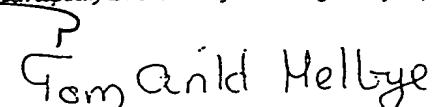
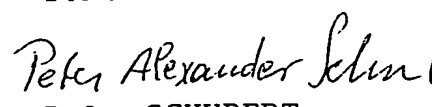
Check-boxes reserved for designating States (for the purposes of a national patent) which have become party to the PCT after issuance of this sheet:

Precautionary Designation Statement: In addition to the designations made above, the applicant also makes under Rule 4.9(b) all other designations which would be permitted under the PCT except any designation(s) indicated in the Supplemental Box as being excluded from the scope of this statement. The applicant declares that those additional designations are subject to confirmation and that any designation which is not confirmed before the expiration of 15 months from the priority date is to be regarded as withdrawn by the applicant at the expiration of that time limit. (Confirmation of a designation consists of the filing of a notice specifying that designation and the payment of the designation and confirmation fees. Confirmation must reach the receiving Office within the 15-month time limit.)



<b>Box No. VI PRIORITY CLAIM</b>					<input type="checkbox"/> Further priority claims are indicated in the Supplemental Box.
Filing date of earlier application (day/month/year)	Number of earlier application	Where earlier application is:			
		national application: country	regional application:* regional Office	international application: receiving Office	
item (1) 20/07/98	GB 9815685.4	GB			
item (2)					
item (3)					
<input type="checkbox"/> The receiving Office is requested to prepare and transmit to the International Bureau a certified copy of the earlier application(s) (only if the earlier application was filed with the Office which for the purposes of the present international application is the receiving Office) identified above as item(s): _____					
<small>* Where the earlier application is an ARIPO application, it is mandatory to indicate in the Supplemental Box at least one country party to the Paris Convention for the Protection of Industrial Property for which that earlier application was filed (Rule 4.10(b)(ii)). See Supplemental Box.</small>					
<b>Box No. VII INTERNATIONAL SEARCHING AUTHORITY</b>					
Choice of International Searching Authority (ISA) (if two or more International Searching Authorities are competent to carry out the international search, indicate the Authority chosen; the two-letter code may be used): ISA /		Request to use results of earlier search; reference to that search (if an earlier search has been carried out by or requested from the International Searching Authority): Date (day/month/year)      Number      Country (or regional Office)			
<b>Box No. VIII CHECK LIST; LANGUAGE OF FILING</b>					
This international application contains the following number of sheets: request : 4 description (excluding sequence listing part) : 7 claims : 2 abstract : 1 drawings : 1 sequence listing part of description : - Total number of sheets : 15		This international application is accompanied by the item(s) marked below: 1. <input checked="" type="checkbox"/> fee calculation sheet 2. <input type="checkbox"/> separate signed power of attorney 3. <input type="checkbox"/> copy of general power of attorney; reference number, if any: 4. <input type="checkbox"/> statement explaining lack of signature 5. <input checked="" type="checkbox"/> priority document(s) identified in Box No. VI as item(s): ( 1 ) 6. <input type="checkbox"/> translation of international application into (language): 7. <input type="checkbox"/> separate indications concerning deposited microorganism or other biological material 8. <input type="checkbox"/> nucleotide and/or amino acid sequence listing in computer readable form 9. <input type="checkbox"/> other (specify):			
Figure of the drawings which should accompany the abstract: 1		Language of filing of the international application: English			
<b>Box No. IX SIGNATURE OF APPLICANT OR AGENT</b>					
Next to each signature, indicate the name of the person signing and the capacity in which the person signs (if such capacity is not obvious from reading the request).					
  					
J.A. McSTEA      R. BRANDENBERGER      T.A. MELBYE Authorised Representative      K.F. GARSHOL      P.A. SCHUBERT					
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1. Date of actual receipt of the purported international application:		2. Drawings: <input type="checkbox"/> received: <input type="checkbox"/> not received:			
3. Corrected date of actual receipt due to later but timely received papers or drawings completing the purported international application:					
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5. International Searching Authority (if two or more are competent): ISA /		6. <input type="checkbox"/> Transmittal of search copy delayed until search fee is paid.			
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<b>Box No. VI PRIORITY CLAIM</b>		<input type="checkbox"/> Further priority claims are indicated in the Supplemental Box.		
Filing date of earlier application (day/month/year)	Number of earlier application	Where earlier application is:		
		national application: country	regional application: * regional Office	international application: receiving Office
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item (2)				
item (3)				
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<small>* Where the earlier application is an ARIPO application, it is mandatory to indicate in the Supplemental Box at least one country party to the Paris Convention for the Protection of Industrial Property for which that earlier application was filed (Rule 4.10(b)(ii)). See Supplemental Box.</small>				
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ISA /				
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Figure of the drawings which should accompany the abstract: 1		Language of filing of the international application: English		
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<small>Next to each signature, indicate the name of the person signing and the capacity in which the person signs (if such capacity is not obvious from reading the request).</small>				
 J.A. McSTEA Authorised Representative		 R. BRANDENBERGER  K.F. GARSHOL		
		 T.A. MELBYE  P.A. SCHUBERT		
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<b>Box No. VII INTERNATIONAL SEARCHING AUTHORITY</b>									
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